



# **Balancing Self-Identity and External Openness in Bilingualism: An AI Perspective**

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## Balancing Self-Identity and External Openness in Bilingualism: An AI Perspective

### Abstract

This study examines the difficulties encountered by non-Arabic speaking students at Islamic University of Madinah in becoming bilingual. This project aims to assess the present condition of bilingualism, investigate the difficulties in maintaining linguistic equilibrium, and develop interventions based on artificial intelligence to improve language skills and promote cultural integration. Data was acquired from 35 non-Arabic speaking students using surveys using a descriptive analytical methodology. The findings indicate that the participants have a moderate degree of bilingual proficiency, with a mean score of 3.5593. It was observed that their proficiency in their native languages is higher, with a mean score of 3.8222, compared to their proficiency in Arabic with a mean score of 3.5111. Arabic is more commonly employed in social situations (mean: 3.8000) than in academic contexts (mean: 3.6000). Although students have academic difficulties as a result of language hurdles (mean: 3.5667), they demonstrate a high level of motivation to improve their Arabic language proficiency (mean: 3.7111). The stated difficulties of utmost importance are linguistic discrimination (mean: 3.6000) and insufficient resources (mean: 3.4667). The findings indicate that interventions powered by artificial intelligence can effectively facilitate balanced bilingualism through the provision of personalised, culturally integrated instruction and immediate feedback. Suggested measures consist of incorporating AI-driven language tools, developing specialised language support centres, and improving teacher training programs. Subsequent investigations should delve into the enduring impacts of artificial intelligence

on bilingual education, the efficacy of cultural immersion programs, and the significance of technological tools such as virtual reality (VR) and augmented reality (AR) in the acquisition of languages.

**Keywords:** Bilingual, dualistic theory, non-Arabic speaking students, artificial intelligence, cultural integration

### **Research Background**

Bilingualism is a complex and dynamic phenomenon that can commence at any point in one's life, ranging from early childhood to advanced age. Certain individuals acquire languages at a young age, while others learn them as adults, frequently as a result of moving to a new region. The timing and manner in which language is acquired are intricately connected to both linguistic and neurological processes. Bilingual individuals, regardless of the timing of language acquisition, employ their languages to different extents and for a range of purposes (Cummins, 2000).

The value of bilingual education is a topic of ongoing debate within the scientific community, recognising its academic, neurolinguistic, social, cognitive, and employment advantages for millions of international students (Parra et al., 2021). The bilingual advantage theory suggests that regularly using two languages can improve brain function by building an intricate relationship between a multilingual individual's self-identity and their interactions with the outside world (Bialystok, 2017).

Bicultural students, especially those learning in unfamiliar locations, have the difficulty of harmonising their mother tongue with the necessity to communicate and study in a second language, such as Arabic. The equilibrium is shaped by their own identity and the way they are seen based on their language utilisation (Norton, 2000). Non-native students in Saudi Arabia must achieve proficiency in Arabic not just to fulfil academic

and social responsibilities, but also to successfully integrate into the culture and negotiate their identity.

The growing number of non-native Arabic students in Saudi Arabia poses challenges and opportunities for cultural and linguistic adaptation. In Saudi Arabia, the combination of a rich historical background and rapid modernisation provides a dynamic environment in which students face the challenge of balancing their self-identity with their interactions with the outside world. Dualistic theories propose that individuals have the ability to maintain a robust cultural identity while also assimilating into a different culture (Alasmari, 2023).

Saudi Arabia demonstrates its dedication to improving global education through its comprehensive government scholarship programs, which provide both domestic and international students with opportunities for internal and external scholarships. These colleges offer extensive aid, such as healthcare services, financial rewards, housing options, social and academic support, and yearly travel allowances, to promote a strong sense of community and belonging. Notwithstanding these endeavours, overseas students in Saudi Arabia still face substantial problems that affect their experiences and achievements. These challenges include cultural adaptation, economic difficulties, social isolation, language barriers, and instances of racism (Alasmari, 2023).

The swift integration of artificial intelligence (AI) in education is transforming the way students learn, providing customised learning experiences, and facilitating language transitions. Nevertheless, this situation prompts significant enquiries regarding the efficiency and ramifications of technology-based language and culture instruction. It is crucial to take into account the subtle aspects of cultural identity and the

possible disadvantages of excessive dependence on technology in creating one's personal identity (Viberg et al., 2020).

### **Problem Statement**

Although artificial intelligence (AI) has the potential to bring about significant changes in education, its use in promoting balanced bilingualism among non-native Arabic speakers at Islamic University of Madinah has not been thoroughly investigated. Prior research has predominantly concentrated on the overall advantages of artificial intelligence (AI) in education, disregarding its particular function in improving language competency and cultural assimilation for this specific group (Tonbuloglu, 2023; Ali et al., 2024).

Non-native Arabic learners at Islamic University of Madinah encounter considerable difficulties in managing the acquisition of the language and cultural assimilation. The Dualistic Theory of Identity and Culture suggests that persons who have dual cultural backgrounds typically face internal difficulties as they try to uphold both identities while adjusting to new situations (Norton, 2000; Van Der Zed & Van Oudenhoven, 2022). Prior studies have not adequately investigated the ways in which AI can assist in achieving this equilibrium.

Studies emphasise the significance of school settings in promoting the development of bilingualism and the advantages of well-organised bilingual programs for job prospects and cross-cultural understanding (Parra et al., 2021). In addition, AI provides accuracy, customisation, and cutting-edge evaluation techniques, greatly improving language competency and cultural understanding (Rusmiyanto et al., 2023; Qiao & Zhao, 2023). Nevertheless, the precise contribution of AI in promoting equitable bilingualism among non-native Arabic speakers at Islamic University of Madinah has not been comprehensively examined.

The objective of this work is to address this deficiency by creating AI-driven treatments that assist individuals who are not natural Arabic speakers in attaining a well-rounded bilingualism. These interventions will combine language proficiency with cultural identification. The research aims to tackle these obstacles in order to enhance our comprehension of bilingualism and offer practical, AI-driven remedies for bilingual education at Islamic University of Madinah.

### **Research objectives**

The research objectives are as follows:

- **RO1:** To assess the present state of bilingualism among non-Arabic speaking students at Islamic University of Madinah.
- **RO2:** To investigate the difficulties encountered by non-Arabic speaking students at Islamic University of Madinah in maintaining a harmonious linguistic equilibrium in their bilingualism.
- **RO3:** To design an artificial intelligence-based intervention aimed at facilitating linguistic balance and reducing the negative impacts of bilingualism on non-Arabic speaking students' cognitive and socio-emotional development.

### **Research questions**

The research questions are as follows:

- **RQ1:** What is the current status of bilingualism among non-Arabic speaking students at Islamic University of Madinah?
- **RQ2:** What are the primary obstacles encountered by non-Arabic speaking students at Islamic University of Madinah in preserving linguistic equilibrium in their bilingualism?
- **RQ3:** How can artificial intelligence be utilised to provide customised treatments that assist non-Arabic speaking pupils in attaining a well-rounded bilingualism that incorporates both self-identity and outward openness?

## **The significance of the study**

### **Theoretical Significance**

- This research bridges a gap in our understanding by examining the potential of artificial intelligence (AI) in creating customised learning environments that enhance language proficiency and cultural sensitivity.
- By further exploring the concept of dualistic theory, we can gain a more comprehensive understanding of the dynamic relationship between self-identity and external openness. This hypothesis facilitates our understanding of how individuals strike a balance between preserving their distinct identity and assimilating into a broader community. Utilising this principle in the context of bilingualism yields interesting perspectives on the challenges and benefits faced by individuals who are not native speakers of Arabic.
- The findings of this study will have a direct influence on teachers and curriculum developers who are involved in educating Arabic language learners, providing them with valuable insights to enhance educational methods. Through comprehending the ways in which artificial intelligence might improve bilingualism, educators can create inventive instructional approaches and attain superior learning outcomes.

### **Practical Significance**

- **Personalised Learning Paths:** AI can analyse learners' language skills, cultural background, and learning preferences to build customised learning strategies. This guarantees that the specific requirements of each individual are taken into account and that a harmonious equilibrium is maintained between linguistic proficiency and cultural consciousness.

- **Adaptive Feedback and Assessment:** Artificial intelligence provides prompt and comprehensive feedback to learners, encouraging self-evaluation and continuous improvement. Furthermore, it has the capability to automate assessment tasks, enabling teachers to focus on providing important feedback and support.
- **Simulated Cultural Immersion:** AI-driven virtual environments and chatbots offer learners the chance to participate in authentic language interactions and immerse themselves in Arabic culture in a secure and encouraging atmosphere. Immersive learning of this kind can enhance cultural sensitivity and alleviate apprehension while engaging in real-life scenarios.

### Research Terms

- **Bilingualism**, as defined by Olson (2024), is the practice of using two or more languages or varieties in daily life. However, persons typically do not possess equal fluency in all language abilities across their languages.
- **Self-identity**, as defined by Snippe, Peters, and Kok (2023), refers to all the ways in which individuals perceive themselves. The importance of each self-representation in shaping one's self-identity is determined by its perceived uniqueness, its ability to contribute positive qualities, and its practical value.
- **Artificial intelligence applications:** According to Ali et al. (2024), artificial intelligence applications refer to technology applications that utilise deep learning models to produce content that resembles human output, such as images and words. These applications are capable of responding to complex and diverse prompts, including different languages, instructions, and questions.



- **External openness** refers to the readiness and capacity to interact with and adjust to external cultural and linguistic influences while preserving one's own identity (Chen, 2013).
- **Perspective:** Perspective refers to the specific viewpoint or angle from which an issue is considered or evaluated (Sam and Berry, 2010).

### **Theoretical framework**

#### **1. Dualistic Theory of Identity and Culture:**

The Dualistic Theory of Identity and Culture suggests that persons who have dual cultural roots typically have internal difficulties as they try to uphold both identities while adjusting to new surroundings. This approach recognises the intricate psychological, social, and linguistic challenges that come with having many cultural identities (Norton, 2000; Van Der Zed & Van Oudenhoven, 2022). An essential component of this theory is comprehending cultural identity, which pertains to the level of engagement in a cultural heritage, encompassing collective ideas, values, practices, rituals, and traditions (Norton, 2000). Acculturation is an important aspect that refers to the process of adapting to a new cultural environment. This process entails using several techniques such as separation, marginalisation, integration, and assimilation (Cummins, 2000; Sorrells & Nakagawa, 2008).

The Dualistic Theory highlights the ongoing challenges experienced by individuals who have dual cultural connections. These individuals frequently confront conflicts and must strive to maintain balance and reconcile different cultural influences and worldviews (Norton, 2000). The process of balancing may give rise to emotional difficulties, leading to a state of perplexity and disorientation. In order to successfully adapt to new cultural environments, the theory proposes the concept of cultural frame shifting as a crucial skill. Cultural frame shifting refers to the

adjustment of an individual's cultural viewpoints in response to various cultural cues, which helps them assimilate into new contexts (Norton, 2000).

Acculturation tactics have a substantial impact on how individuals handle their dual cultural identities. Integration entails the preservation of one's cultural identity in both the native and adopted cultures, facilitating a seamless amalgamation of both (Cummins, 2000). On the other hand, assimilation necessitates that individuals undergo substantial adjustments to the new culture, frequently at the cost of their own cultural identity (Van Der Zed & Van Oudenhoven, 2022). In contrast to these tactics, detachment involves individuals actively disengaging from the new cultural environment, whereas marginalisation refers to their experience of isolation and exclusion by the prevailing culture (Sorrells & Nakagawa, 2008). Over time, individuals may progress from a state of marginalisation to a state of integration as they adjust to their new surroundings (Cummins, 2000).

The Dualistic Theory also connects with bigger ideas, such as Identity Negotiation Theory and Identity Salience Theory. Identity Negotiation Theory explores how individuals navigate and manage their identities in various social settings, while Identity Salience Theory investigates the significance of cultural identities in shaping one's thoughts and actions (Tajfel & Turner, 1986; Van Der Zed & Van Oudenhoven, 2022). These viewpoints are essential for comprehending the intricacies of upholding numerous cultural identities, as they confront ethnocentric notions that sustain unequal distribution of power and restrict individuals' capacity to traverse cultural disparities (Sorrells & Nakagawa, 2008).

Overall, the Dualistic Theory of Identity and Culture offers a thorough structure for comprehending the psychological, social, and linguistic elements involved in maintaining multiple cultural identities. The statement emphasises the significance of cultural frame shifting and diverse acculturation processes in adjusting to unfamiliar surroundings. This theory, in conjunction with other identity theories, emphasises the necessity of adopting a critical cultural perspective towards identity, which centres on cultivating cultural consciousness, engaging in negotiation, and fostering empowerment.

## **2. Bilingualism and Cognitive Development:**

Cognitive development is an ongoing and enduring process that is impacted by a multitude of elements, such as genetic makeup, surroundings, and personal encounters. Bilingualism has a substantial influence on the process of acquiring and mastering language, which plays a crucial role in cognitive development. Bilingualism, which refers to the capacity to communicate proficiently in two or more languages, is a prevalent occurrence on a global scale (Cummins, 2000). Multiple theories examine the influence of bilingualism on cognitive and social development, offering useful insights into this intricate connection.

The threshold theory is a highly influential idea that proposes a positive correlation between bilingualism and cognitive capacities. This idea suggests that being bilingual improves cognitive abilities such as problem-solving, memory, and attention (Cummins, 1979). Nevertheless, it is important to note that not all individuals who are bilingual enjoy cognitive enrichment. In fact, certain research indicate that being bilingual may not definitely boost cognitive capacities, as suggested by Cummins (2000). These contrasting results emphasise the necessity for additional investigation into the circumstances in

which bilingualism may or may not provide cognitive advantages.

The Dynamic Systems Theory of individual differences in cognitive and neural development considers bilingualism as an intricate interplay between linguistic inputs and cognitive processes, leading to distinct cognitive profiles for each person (van der Zed & van Oudenhoven, 2022). This viewpoint emphasises the diversity in cognitive development among individuals who are bilingual, indicating that personal distinctions have a substantial impact on how bilingualism affects cognitive results.

Social Identity Theory offers valuable insights into the impact of bilingualism on cognitive and social development. According to Tajfel and Turner (1986), multilingual individuals are more likely to possess a robust cultural identity and enhanced cultural sensitivity and empathy, which allows them to effectively negotiate diverse cultural backgrounds. Recent research emphasises the significance of social factors in this correlation. Children who grow up in circumstances where only one language is spoken tend to have poorer scores in terms of their ability to adapt their identity and their cultural sensitivity, compared to children who are raised in families where many languages are spoken (Norton, 2000). This suggests that the social environment and being exposed to different languages might have a substantial impact on cognitive and social results.

To summarise, the correlation between bilingualism and cognitive development is intricate and diverse. Diverse ideas provide distinct viewpoints on the impact of bilingualism on cognitive capacities and social engagements. Although valuable knowledge has been acquired, additional investigation is required to comprehensively comprehend the intricacies and

consequences of bilingualism on cognitive and social growth. The relationship between bilingualism and cognitive development highlights the significance of well-informed language education and policy. These observations can assist educators and policymakers in establishing nurturing settings that optimise the cognitive and social advantages of bilingualism.

### **3. Artificial Intelligence in Language Acquisition:**

Artificial Intelligence (AI) has been a highly influential technical instrument for enhancing linguistic research, especially in the field of second language acquisition, in recent years. The incorporation of artificial intelligence (AI) technologies into language education has the capacity to completely transform the approaches employed in the acquisition and instruction of foreign languages. AI breakthroughs can result in improved language skills and increased intercultural competency by offering exceptional degrees of precision, individualisation, and unique assessment methodologies.

Multiple studies emphasise the successful utilisation of artificial intelligence (AI) techniques to enhance language proficiency and cultural competence. An illustrative case is the research conducted by Wei (2023), which revealed notable enhancements in learners' speaking fluency and skills as a result of AI-driven education. For this research, a total of 60 second language (L2) Chinese learners were randomly divided into two groups: a control group and an experimental group. The experimental group was instructed using an AI-based language learning platform that offered customised and adaptable learning experiences designed to meet the individual needs and performance of each student. The findings revealed that the experimental group had a notably higher enhancement in their

second language (L2) speaking skills in comparison to the control group.

In a study conducted by Rusmiyanto et al. (2023), the role of artificial intelligence (AI) in enhancing the communication abilities of English language learners was thoroughly analysed. AI-driven tools offer learners feedback, evaluation, and guidance to create an adaptable and tailored learning experience. Through the analysis of student performance data and the provision of immediate feedback based on specific errors, artificial intelligence (AI) has enhanced competence, enabling learners to master essential skills more efficiently.

In their study, Qiao and Zhao (2023) conducted additional research to examine the diverse effects of AI-assisted language tools on different abilities and sub-skills, such as grammar, pronunciation, speaking, writing, and listening. The experiments show that AI systems improve language acquisition by providing immediate and personalised feedback, which can be identified through learner performance data. In addition, AI tools offer a plethora of educational materials and interactive tasks that actively involve learners in language acquisition, hence enhancing the entire learning process.

In a study conducted by Asim (2023), the impact of AI technology on second language acquisition (SLA) was examined, specifically its ability to enhance language competency and cultural competence. This study investigated the application of AI-based language learning tools in cross-cultural environments. The findings indicate that these tools effectively enhance learners' intercultural competency by stimulating their motivation to practice the target language and engage with the target culture. The results suggested that the utilisation of

artificial intelligence tools in second language acquisition (SLA) settings enhanced learners' motivation and levels of engagement. In addition, a study conducted by Darwin et al. (2024) specifically examined the application of artificial intelligence (AI) to improve the advancement of critical thinking skills in students who are learning English as a Foreign Language (EFL). Critical thinking is an essential aspect of language competency and cultural competence. It equips learners with the necessary analytical abilities to comprehend intricate texts, identify arguments, and assess evidence. The study revealed that AI is essential in language acquisition as it provides prompt feedback and involves learners in interactive activities that promote critical thinking abilities.

Research findings conclusively support the idea that AI tools have a substantial impact on improving students' language competency and cultural competence. AI accomplishes this by providing tailored and flexible learning experiences, prompt and personalised feedback, and inventive techniques for ongoing assessment. AI tools facilitate the acquisition of intercultural competence and enhance critical thinking abilities, both of which are vital for achieving language proficiency and cultural competence. Investing in AI technology has the potential to greatly enhance language teaching by increasing accessibility, effectiveness, and learner-centredness.

### **Literature review**

This literature review examines the issue of bilingualism in relation to self-identity and external openness, within the framework of the dualistic philosophy. The examined studies are presented in chronological order, emphasising the advancement of research in this field.

The study conducted by Kałamala et al. (2020) investigated the adaptive control hypothesis, which posits that

bilingualism improves cognitive regulation. The researchers conducted a comprehensive investigation using a large sample size and advanced statistical techniques to address discrepancies in prior research on the multilingual advantage. Their research showed that the level of exposure to a dual language environment did not enhance the ability to regulate reactions in bilingual individuals. This contradicts the adaptive control hypothesis and suggests that it may not completely account for the inconsistent outcomes shown in studies on the bilingual advantage.

Dorambari (2021) conducted a study that specifically examined the differentiation between subtractive and additive bilingualism in the context of the Albanian language. This study emphasised the adverse effects of subtractive bilingualism and suggested strategies to foster additive multilingualism. Dorambari determined that educational environments should adopt additive bilingualism as a model to minimise the detrimental impacts of subtractive bilingualism on sociological, socio-psychological, and psychological aspects. The study offered precise suggestions for higher education institutions to promote additive bilingualism in classrooms, highlighting the significance of educational strategies in cultivating favourable bilingual results.

In addition, Parra et al. (2021) evaluated the influence of bilingual programs on the employability, mobility, and intercultural awareness of graduates, comparing them to graduates from programs that are not bilingual. Their statistical study revealed that bilingual programs had a substantial impact on these crucial outcomes, thereby establishing a reliable basis for evaluating the effectiveness of bilingual education. This



study highlights the tangible advantages. of bilingual programs, namely in equipping graduates for the international job market. Furthermore, Naranowicz et al. (2022) conducted a study to examine the impact of emotions on the cognitive processing of language and meaning in individuals who are bilingual. Their research included individuals who were fluent in both Polish and English. These participants assessed the significance of words in both languages while their brain activity was recorded using EEG technology. The recording sessions were conducted while the participants watched films that evoked either happy or negative emotions. The results revealed that emotions have a clear influence on the way words and meanings are understood in both native and non-native languages. This sheds light on how emotions are involved in the processing of bilingual language.

Wang and Lehtomäki (2022) conducted a study to examine how the cultural link of the Yi minority to ethnocultural upkeep affects their social integration into the broader social system. The study also explored how mainstream and bilingual schooling impact these dynamics. The researchers conducted a multinomial logistic regression analysis on survey data collected from junior high schools in Liangshan. Their findings revealed that family socioeconomic status had an impact on school choice. Additionally, educational attainment and career expectations were found to be associated with school environments. Furthermore, the study showed that attending Chinese-only schools resulted in a decrease in cultural attachment to the Yi mother tongue. On the other hand, bilingual schooling maintained this cultural connection, emphasising the sociocultural consequences of bilingual education among minority communities.

In addition, Kałamała et al. (2023) proposed a psychometric model for assessing bilingualism, highlighting its

increasing significance in the fields of psychology and neuroscience. The study examined data from young adult bilinguals who have an imbalance in their language proficiency. It discovered important measures of bilingualism, including language entropy, language mixing, and subjective competence assessment. This study showcases the efficacy of psychometric network modelling in comprehending the intricate (psycho)linguistic and cognitive aspects of bilingualism, yielding a more nuanced comprehension of bilingual encounters.

Based on the presentation of the prior study, the researcher derived significant advantages from these endeavours in several domains, which can be succinctly summarised as follows:

- The present study has utilised the findings and suggestions from prior research to identify the problem and establish the research questions and objectives.
- The support from previous studies has played a vital role in constructing the theoretical framework for the current study and seeking guidance from authoritative sources that pertain to the subject matter.
- The researcher has relied on previous studies to analyse and interpret the results obtained from the current study.

## **METHODOLOGY**

The research methodology and its procedures play a significant role in achieving the practical goals of the research. The collected data is used to do statistical analysis and interpret the results in the context of relevant research literature. This helps to meet the goals of the research. The research methodology employed in this study is the descriptive analytical approach, which aligns with the research objectives and aims.

### **A. The study's population**

The study population refers to a preset group of elements that are examined using various analytical methods and tools, and notes are recorded on them, which contribute to extracting the most important results from them (Kałamała et al., 2023). The current research community consists exclusively of students at Islamic University of Madinah who do not speak Arabic.

### **B. Study's Sample**

The study sample refers to a specific subset of the population that is selected by the researcher to accurately represent the larger society, based on specific criteria and guidelines (Kałamała et al., 2023). Research studies suggest that a sample size of less than 30 may not accurately represent the characteristics of the population being studied. Therefore, differences between averages are considered statistically significant when obtained from a larger sample. Additionally, the appropriate sample size depends on the specific research being conducted. Statisticians have established a guideline stating that in correlational research, the sample size should be at least 30. However, in experimental research, each group should have a minimum sample size of 15 (Damen, 2007).

- **Sampling Technique**

The study sample comprised 35 students who are studying at the Islamic University of Madinah and do not speak Arabic.

### **C. Instrumentation**

- **Questionnaire**

A questionnaire is a document containing a series of questions that pertain to an opinion poll or the characteristics of a particular administrative, economic, or social activity. By analysing the responses to these questions, we can gather statistical data. Therefore, designing a questionnaire requires careful consideration and a thorough understanding of the

sample being studied. Conduct thorough research to gain knowledge and comprehension of cultural customs and even the meanings of words (Baldawi, 2007).

A survey was developed to assess the present condition, and difficulties encountered by non-Arabic speaking students at the Islamic University of Madinah in preserving language equilibrium in their bilingualism. The questionnaire comprised two sections:

- **First:** demographic data (nationality, college, level).
- **Second:** The bilingualism questionnaire, in turn, consists of two axes to measure the (current status and challenges), each axe contains nine paragraphs.

The measurement of each construct will be conducted using a five-point Likert scale, which will span a range of: 1- Strongly disagree; 2- Disagree; 3- Neutral; 4- Agree; 5- Strongly Agree.

The questionnaire items were rated on a five-point Likert scale ranging from 1 to 5. A higher score implies greater approval of the statement, while a lower score suggests less acceptance.

To assess the present situation and difficulties encountered by non-Arabic speaking students at the Islamic University of Madinah in maintaining linguistic equilibrium in their bilingualism, the following statistical scores will be employed to evaluate the mean values, as per the subsequent equation:

$$\begin{aligned}\text{Category length} &= \frac{\text{highest score} - \text{lowest score}}{\text{number of categories}} \\ &= 5-1/3 \\ &= 1.33\end{aligned}$$

Table No. (1) displays the statistical criteria for interpreting the arithmetic means of the research sample's responses to the questionnaire items:

**Table No. (1). The statistical standard for the interpretation of arithmetic averages**

Low rating level	Medium rating level	High rating level
1 – 2.33	2.34 – 3.67	3.68 – 5

The researcher prepared the research tool (the questionnaire) to find out "the current status and the challenges faced by non-Arabic speaking students at Islamic University of Madinah in maintaining linguistic balance in their bilingualism".

#### • **Questionnaire Validity and Reliability**

Prior to gathering data, it is crucial and advisable to run a pilot study to assess the validity and reliability of the questionnaire being used, employing statistical analysis. The purpose of the pilot study is to assess the questionnaire's effectiveness before to commencing the main study. To do this, the researcher conducted a pilot study prior to collecting the main data in order to evaluate the consistency of the questions and the respondents' comprehension of the questionnaire. These pupils will be omitted from the list of final participants in the primary data collection.

#### – **Questionnaire validity**

As stated in Oktavia (2018), researchers commonly use Pearson's correlation coefficient (also known as Pearson's product-moment correlation coefficient, or PPMCC) to calculate construct validity metrics. This coefficient is obtained by correlating the scores of respondents' responses to an item with their total scores. The calculation for Pearson's correlation coefficient is as follows:

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2] [n \sum y^2 - (\sum y)^2]}}$$

In this study, Pearson's correlation coefficient (r) was used to measure the relationship between two variables. The number of valid responses (n) was taken into account. The variable x represents the score of an item, while y represents the total score of each respondent with valid responses. It was assumed that both variables (x and y) followed a normal distribution. The statistical analysis was conducted using SPSS software, and the results are presented in Table 2.

**Table 2: Pearson's correlation coefficient for the questionnaire**

No.	Item	Correlation coefficient with questionnaire parts score	Correlation coefficient with total questionnaire score
<b>First axe: the current status of bilingualism among non-Arabic speaking students.</b>			
1	I have proficiency in Arabic.	0.469*	0.475*
2	I have proficiency in my native language.	0.0686**	0.801**
3	I used to speak Arabic frequently in my daily academic communications.	0.695**	0.743**
4	I used to speak Arabic frequently in my daily social communications.	0.501**	0.369**
5	I feel integrated into the local culture through language.	0.568**	0.469**
6	I interact with native Arabic speakers in my daily life.	0.727*	0.606*
7	I face difficulties in academic settings due to language barriers.	0.560**	0.506**
8	I prefer Arabic for consuming media (e.g., reading, television, internet).	0.812**	0.871**
9	I plan to continue improving my Arabic skills after my studies.	0.518**	0.464**
<b>Second axe: the challenges faced by non-Arabic speaking students in</b>			

<b>maintaining linguistic balance in their bilingualism.</b>			
<b>10</b>	I find that one language interferes with my ability to use or learn the other language effectively.	0.704**	0.586**
<b>11</b>	There are sufficient resources (e.g., books, courses, language practice clubs) available for learning Arabic.	0.769**	0.831**
<b>12</b>	I have no cultural differences that have ever hindered my language learning or usage.	0.539*	0.425**
<b>13</b>	I find the current instructional methods for Arabic is very effective.	0.784**	0.743**
<b>14</b>	I receive adequate support from peers in language learning.	0.561**	0.464**
<b>15</b>	I experienced forms of linguistic discrimination in academic or social settings.	0.704**	0.586**
<b>16</b>	I used to use technological aids (e.g., language learning apps, online courses) to improve my language skills.	0.765**	0.705*
<b>17</b>	The struggle with linguistic balance affects my mental health.	0.647**	0.475**
<b>18</b>	The struggle with linguistic balance affects my academic performance.	0.769**	0.831**

The correlation is significant at the 0.05 level.

\*\* The correlation is significant at the 0.00 level.

The table provided displays the correlation coefficients between each paragraph of the questionnaire and the scores of each part, as well as the overall score of the questionnaire. The significance levels are set at 0.00 and 0.05. The correlation coefficients range from 0.373 to 0.831. Based on these results, it can be concluded that the items and parts of the questionnaire are valid for measuring their intended purposes.

### - Questionnaire reliability

The Cronbach  $\alpha$  (alpha) measurement is utilised to assess the internal consistency and reliability of the questionnaire. The reliability of the questionnaire increases as the value of  $\alpha$  increases, as indicated by internal consistency. The value of  $\alpha$  is provided on the following scale, as illustrated in Table 3 (source: (Al-Ayyouby, 2012):

**Table. 3: Cronbach  $\alpha$  (alpha) values**

$\alpha > 0.9$	$\alpha > 0.8$	$\alpha > 0.7$	$\alpha > 0.6$	$\alpha > 0.5$	$\alpha < 0.5$
Excellent	Good	Acceptable	Questionable	Poor	Unacceptable

Hence, the researcher employed the Cronbach Alpha Coefficient to assess the reliability of the questionnaire in the pilot study. The statistical software SPSS was used to generate the results, which are presented in Table 4.

**Table 4: Cronbach's alpha coefficient for the questionnaire**

Questionnaire parts	Cronbach Alpha Coefficient
Axe 1 (the current status)	0.907
Axe 2 (the challenges)	0.892
Whole Questionnaire	0.898

The results presented in Table 5 clearly indicate that the Cronbach alpha coefficient values for each section of the questionnaire are high, ranging from 0.907 to 0.892. The overall questionnaire achieved a value of 0.898, indicating a high level of stability that is statistically significant.

## Results

### 1. Results related to the first question.

To address the first inquiry, "What is the present state of bilingualism among students at the Islamic University of Madinah who do not speak Arabic?" The table below displays the mean and standard deviation of the sample responses for each paragraph in the questionnaire.



**Table 5: Sample responses to the first question**

No.	Paragraph	Arithmetic average	Standard deviation	Effect	Order
1.	I have proficiency in Arabic.	3.5111	1.03038	Medium	7
2.	I have proficiency in my native language.	3.8222	.89415	High	1
3.	I used to speak Arabic frequently in my daily academic communications.	3.6000	1.06844	Medium	4
4.	I used to speak Arabic frequently in my daily social communications.	3.8000	1.08307	High	2
5.	I feel integrated into the local culture through language.	3.5222	1.05178	Medium	6
6.	I interact with native Arabic speakers in my daily life.	3.3667	1.09596	Medium	8
7.	I face difficulties in academic settings due to language barriers.	3.5667	1.14214	Medium	5
8.	I prefer Arabic for consuming media (e.g., reading, television, internet).	3.1333	1.19173	Medium	9
9.	I plan to continue improving my Arabic skills after my studies.	3.7111	.91485	High	3
<b>Total</b>		<b>3.5593</b>	<b>1.0525</b>	<b>Medium</b>	

The previous table indicates that the level of bilingualism among non-Arabic speaking students at Islamic University of Madinah is classified as "medium," with an average of 3.5593 and a standard deviation of 1.0525. This suggests that although students demonstrate a satisfactory level of skill and usage in Arabic, their mastery of the language is still subordinate to their higher level of competency in their mother tongues. This equilibrium demonstrates the students' endeavours to preserve their individuality while still being receptive to assimilating into

their Arabic speaking surroundings. To have a deeper comprehension of this equilibrium, it is possible to examine particular aspects of their multilingual encounter:

– **Proficiency in Arabic and Native Languages:**

Students exhibited greater aptitude in their mother tongues (mean: 3.8222) in contrast to Arabic (mean: 3.5111). This discrepancy suggests that while students possess a functional understanding of Arabic, their proficiency in their mother tongues is more advanced. This corroborates the research conducted by Kałamała et al. (2020), which concluded that bilingualism does not inherently enhance cognitive regulation, hence elucidating the reason why students may not attain equivalent competency in both languages. The presence of a proficiency gap suggests that non-cognitive elements, such as emotional and contextual impacts, have a substantial impact on language acquisition.

– **Frequency of using Arabic:**

The frequency of utilising Arabic in academic contexts was assessed as moderate (mean: 3.6000), indicating that although students employ Arabic consistently in their academic pursuits, they may encounter difficulties and occasionally resort to their mother tongue. Conversely, the utilisation of Arabic in social situations garnered a superior rating (mean: 3.8000), suggesting that students exhibit greater ease in employing Arabic in casual settings. This is consistent with the research conducted by Wang and Lehtomäki (2022), which highlights the significance of conducive school settings for language acquisition. The moderate utilisation of Arabic in academic settings implies a requirement for enhanced instructional methodologies, while the elevated social utilisation signifies successful cultural assimilation beyond academic environments.

– **Cultural Integration and Interaction with Native Speakers:**

The level of cultural integration experienced through language was also assessed to be moderate (mean: 3.5222), indicating that although students are actively engaged with the language, there is still a requirement for more profound cultural immersion. This discovery aligns with the research conducted by Dorambari (2021), which concluded that the type of education had a substantial impact on cultural affinity and social assimilation. The moderate level of cultural integration indicates that although pupils are partially involved, additional measures are required to enhance their cultural immersion.

– **Academic Difficulties and Media Consumption:**

Notwithstanding these difficulties, students have shown a commendable degree of drive to enhance their proficiency in Arabic subsequent to their education (mean: 3.7111). An optimistic perspective is a crucial element in attaining fluency in a language. The research conducted by Parra et al. (2021) suggests that carefully planned multilingual programs enhance results such as job prospects and cross-cultural understanding. The students' strong drive to strengthen their Arabic skills is consistent with this discovery, indicating that improved educational assistance can result in higher language competency and integration.

Ultimately, the students at Islamic University of Madinah demonstrate a sophisticated equilibrium between their own identity and their willingness to engage with the outside world. Although they are more proficient in their own languages, their extensive use of Arabic in academic and social contexts demonstrates their capacity to adapt and their readiness to assimilate into the local society. The maintenance of this

equilibrium is crucial for their assimilation into the culture and achievement in academics, underscoring the significance of promoting both self-identity and flexibility to external circumstances through comprehensive educational approaches.

### 1. Results related to the second question.

To address the second inquiry, "What are the primary obstacles encountered by non-Arabic speaking students at the Islamic University of Madinah in maintaining linguistic equilibrium in their bilingualism?" The table below displays the mean and standard deviation of the sample responses for each paragraph in the questionnaire:

**Table 6: Sample responses to the second question**

No.	Paragraph	Arithmetic average	Standard deviation	Effect	Order
10.	I find that one language interferes with my ability to use or learn the other language effectively.	3.4222	.93590	Medium	7
11.	There are sufficient resources (e.g., books, courses, language practice clubs) available for learning Arabic.	3.4667	1.05148	Medium	5
12.	I have no cultural differences that have ever hindered my language learning or usage.	3.4444	.93750	Medium	6
13.	I find the current instructional methods for Arabic is very effective.	3.1000	1.27244	Medium	8
14.	I receive adequate support from peers in language learning.	3.5333	.99662	Medium	3
15.	I experienced forms of linguistic discrimination in academic or social settings.	3.6000	1.07891	Medium	1
16.	I used to use technological aids	3.5556	1.13287	Medium	2

	(e.g., language learning apps, online courses) to improve my language skills.				
17.	The struggle with linguistic balance affects my mental health.	3.4667	1.00783	Medium	5
18.	The struggle with linguistic balance affects my academic performance	3.4889	1.06259	Medium	4
<b>Total</b>		<b>3.4531</b>	<b>1.0529</b>	<b>Medium</b>	

The previous table indicates that non-Arabic speaking students at the Islamic University of Madinah encounter a moderate level of difficulty in preserving linguistic balance in their bilingualism. This is shown in the arithmetic mean of 3.4531 and a standard deviation of 1.0529. The main difficulties can be attributed to many sources:

#### Interference Between Languages:

According to the students' reports, one language frequently hinders their proficiency in using or acquiring the other language, with an average rating of 3.4222. This discovery is consistent with the research conducted by Bialystok (2011), which suggests that bilingual individuals may encounter cognitive strain as a result of juggling two languages. This strain can have an impact on their language skills and ability to learn. The presence of this interference, together with the obstacles posed by cultural disparities in language acquisition (mean: 3.4444), underscores the intricacies involved in upholding several cultural identities. According to the Dualistic Theory of Identity and culture, people who possess two distinct cultural backgrounds frequently have inner conflicts while adjusting to unfamiliar surroundings. The source cited is from Norton (2000).

### **Availability of Resources:**

The accessibility of Arabic learning resources was assessed as moderate, with an average score of 3.4667. While resources may be available, they may not be adequate or entirely efficient. Cummins (2000) highlights the importance of having access to top-notch educational resources in order to achieve success in bilingual education. This underscores the necessity for the development of more comprehensive support materials and programs.

### **Cultural Differences:**

According to the students, cultural differences have a moderate impact on their language learning or usage, as shown by a mean value of 3.4444. This corroborates Norton's (2000) study, which highlights the substantial influence of cultural identity on the process of language acquisition and proposes that cultural obstacles can hinder advancement.

### **Instructional Methods:**

The present instructional approaches for teaching Arabic were deemed moderately effective, with an average score of 3.1000. This suggests a requirement for enhanced pedagogical techniques. Krashen (1982) contends that language training should be both captivating and contextually pertinent in order to optimise language acquisition. This suggests that current techniques may need to be reevaluated and adjusted to better cater to the needs of pupils.

### **Peer support and discrimination:**

Students indicated sufficient peer support in language acquisition (mean: 3.5333), but they also reported instances of linguistic discrimination in academic or social contexts, with an average rating of 3.6000. This aligns with research indicating that social support plays a crucial role in language acquisition

(Vygotsky, 1978), and that discrimination can have a significant impact on self-assurance and drive (Norton, 2000). These findings are consistent with the Identity Negotiation Theory and the Identity Salience Theory, which highlight the process of negotiating identities in different social situations and the significance of cultural identities in influencing behaviour (Tajfel & Turner, 1986).

#### **Use of Technological Aids:**

The utilisation of technological tools to enhance language proficiency was given a relatively good rating, with an average score of 3.5556. These instruments are evidently advantageous for students. According to Chapelle (2001), technology has the potential to greatly improve language acquisition by providing interactive and individualised experiences.

#### **Impact on Mental Health and Academic Performance:**

The challenge of maintaining language equilibrium has a detrimental impact on the mental well-being (mean: 3.4667) and scholastic achievements (mean: 3.4889) of students. This discovery mirrors the research conducted by Rumbaut in 1994, emphasising the psychological and intellectual difficulties encountered by pupils who are fluent in two languages. The observed effect is consistent with the threshold hypothesis of bilingualism, which proposes that while being bilingual can improve cognitive capacities, it also places a cognitive burden that can result in stress and harm academic performance (Cummins, 1979).

Overall, non-Arabic speaking students at the Islamic University of Madinah have a variety of complex problems in preserving language equilibrium, which are considered to be of moderate difficulty. The issues encompass language interference, resource availability, cultural disparities, and teaching method efficacy. Furthermore, linguistic discrimination, the utilisation of

technological aids, and the effects on mental well-being and academic achievement are substantial concerns. To tackle these problems, it is necessary to strengthen educational resources and methodologies, offer additional cultural and peer support, and reduce discrimination. in order to enhance the bilingual experience as a whole. By combining the principles of the Dualistic Theory of Identity and Culture with the use of advanced technology, we can create a comprehensive framework to assist bilingual students in their educational progress. Effective educational methods, enriched resources, and nurturing surroundings are crucial for promoting successful bilingualism and overall academic success.

### **Results related to the third question.**

To address the final inquiry, "How can artificial intelligence be utilised to create customised interventions that assist non-Arabic speaking students in attaining a harmonious bilingualism that incorporates both self-identity and external openness?" The following recommendations can be made:

Artificial intelligence (AI) was utilised to create tailored intervention programs for non-Arabic speaking students at the Islamic University of Madinah. These programs aimed to help students achieve balanced bilingualism and employed various tools and approaches. Here are some methods by which AI can integrate self-identity with external openness in language acquisition:

### **Adaptive Learning Systems:**

AI-powered adaptive learning systems have demonstrated significant efficacy in promoting second language acquisition and attaining balanced bilingualism. These systems achieve this by customising training to meet the unique needs of individual learners and integrating cultural aspects into the curriculum.



Examples of platforms that embody this strategy include Duolingo, Rosetta Stone, Memrise, and Busuu. Duolingo provides customised courses that deliver instant feedback, greatly improving the process of learning a language and increasing learner involvement. Research has demonstrated that Duolingo's adaptive learning methods can encompass the equivalent content of an introductory college language course (Vesselinov & Grego, 2012). Additionally, the incorporation of gamification elements in Duolingo enhances learner involvement. However, there is room for enhancement in terms of providing more opportunities for authentic language practice (Purwanto & Syafryadin, 2023). Rosetta Stone employs immersive techniques to facilitate efficient learning, namely in the areas of vocabulary acquisition and reading comprehension. Nevertheless, to adequately improve conversational abilities, it is necessary to combine this approach with conventional ways (Golonka et al., 2014; Lord, 2016; Slimani & Jabal, 2023).

Memrise utilises spaced repetition and multimedia materials to enhance memory retention, facilitating the long-term acquisition of language and its practical application (Li, 2015). Studies have shown that AI-powered tools offer learners adaptive and personalised learning experiences. These tools improve different language skills by providing real-time feedback and customised training (Rusmiyanto et al., 2023 & Qiao and Zhao, 2023). Busuu prioritises interactive learning by incorporating feedback from native speakers, which improves the retention of knowledge and overall learning results. However, its main concentration on Modern Standard Arabic may restrict its effectiveness in teaching spoken dialects (Rosell-Aguilar, 2018). The diverse effects of AI-powered language tools, which encompass enhancements in grammar, pronunciation, speaking, writing, and listening, showcase their

potential in fostering well-rounded bilingualism through personalised and culturally integrated content. However, their optimal efficacy is achieved when combined with other learning approaches to cultivate comprehensive language proficiency (Asim, 2023 & Wei, 2023).

### **Natural Language Processing (NLP):**

Artificial intelligence-powered natural language processing (NLP) systems have the capability to create apps that can aid in the process of learning languages. These applications can include conversational bots, language games, and virtual tutors. These technologies provide immediate feedback and corrections, enhancing the learning experience by making it more engaging and participatory. In addition, they incorporate cultural subtleties and idiomatic phrases to enrich comprehension of both language and culture. Natural Language Processing (NLP) tools like the Tool for the Automatic Assessment of Lexical Sophistication (TAALES) and the Tool for the Automatic Analysis of Cohesion (TAACO) are employed to examine linguistic characteristics, assisting in the enhancement of language proficiency and cultural competence (Balyan et al., 2019). Furthermore, research has demonstrated that NLP applications can successfully enhance language learning by increasing learners' involvement and communication through tailored feedback and adaptable learning trajectories (Kassimi & Essayad, 2023).

### **Cultural Sensitivity Algorithms:**

Artificial intelligence has the capability to examine large amounts of data regarding student activities and preferences. Algorithms derived from this data can detect patterns that are associated with students' cultural backgrounds and incorporate these findings into language learning materials, guaranteeing both linguistic precision and cultural appropriateness. Research

has demonstrated that AI algorithms may customise instructional material to align with cultural contexts, resulting in improved learning efficiency and cultural appreciation (Kassimi & Essayad, 2023). These algorithms employ data analytics to customise the learning experience, rendering it more pertinent and captivating for learners from various cultural backgrounds.

### **Personalised Content Delivery:**

Artificial intelligence has the ability to select and suggest customised educational material by taking into account an individual's specific tastes and interests. For example, if a student demonstrates curiosity about particular facets of Saudi culture, like music, cuisine, or history, AI might incorporate these subjects into the language sessions, thus sustaining the learner's interest and enhancing their cultural understanding. Studies have shown that individualised learning routes have a substantial positive impact on learning outcomes. This is because they make the content more relevant and interesting for learners (Klašnja-Milićević et al., 2021). Furthermore, research has demonstrated that AI-powered customised content can boost motivation and engagement by tailoring instructional materials to match learners' individual interests and cultural backgrounds (Peng, Ma, & Spector, 2019).

### **Virtual reality (VR) and augmented reality (AR):**

Virtual reality (VR) and augmented reality (AR) technologies have the ability to replicate genuine experiences in Arabic, immersing learners in common or culturally important situations that necessitate active conversation. This immersive methodology enables learners to engage in language practice within real-life situations, which is essential for cultivating a functional comprehension and admiration of both the language and culture. Research has shown that virtual reality (VR) and augmented reality (AR) are effective tools for language learning.

These technologies provide immersive experiences that boost the retention and practical application of language skills. Wang et al. (2020) conducted a meta-analysis that provided evidence supporting the considerable improvement of students' attitudes and self-efficacy in language acquisition through the use of virtual reality (VR). Moreover, a study conducted by Cambridge English emphasises the advantages of augmented reality (AR) and virtual reality (VR) in improving the acquisition of vocabulary and offering authentic language learning experiences (Reinders, 2022).

### **Predictive Analytics:**

Artificial intelligence has the capability to examine patterns of learning and outcomes in order to forecast possible learning challenges and take proactive measures to address them. This could entail modifying the level of difficulty for tasks, providing extra assistance, or recommending culturally enlightening recreational activities. Predictive analytics aid in identifying students who are at a higher risk of encountering difficulties and tailoring interventions to meet their individual requirements, therefore improving the overall learning experience. A study conducted by Gonzalez-Nucamendi et al. (2023) emphasised the utilisation of predictive analytics to identify students who are at risk of dropping out and implementing timely interventions to enhance retention rates. A separate study conducted by Ekowo and Palmer (2016) highlighted the significance of ethical principles in predictive analytics to guarantee that data-based judgements are advantageous and fair for every student.

### **Collaborative Learning Environments:**

AI can enhance collaborative learning environments by promoting cooperation among individuals. Artificial intelligence can enhance cooperation among students from various cultural

backgrounds within virtual platforms, promoting interchange and engagement in the Arabic language. This enhances linguistic abilities and fosters cultural interchange and reciprocal comprehension, facilitating the cultivation of a well-rounded bilingual and bicultural identity. AI-supported collaborative learning environments facilitate peer-to-peer learning and cultural interchange, both of which are crucial for effective language acquisition (Kassimi & Essayad, 2023).

To summarize, the use of AI-driven interventions can greatly assist non-Arabic speaking students at Islamic University of Madinah in attaining a state of balanced bilingualism. Adaptive learning platforms such as Duolingo and Rosetta Stone offer customised, culturally immersive lessons that improve user involvement and memory retention. Natural Language Processing (NLP) tools facilitate interactive learning by providing immediate feedback, thereby enhancing comprehension of both language and culture. By utilising cultural sensitivity algorithms and targeted content distribution, we guarantee that the learning materials provided are both pertinent and captivating, specifically designed to cater to individual interests and cultural backgrounds. Virtual reality (VR) and augmented reality (AR) technologies enable immersive experiences that strengthen practical language abilities. Predictive analytics are used to identify students who are in danger of falling behind and offer personalised support to improve learning outcomes. AI-enabled collaborative learning settings ultimately foster cultural exchange and mutual understanding, which are crucial for cultivating well-rounded bilingual and bicultural identities.

By utilising AI-driven methods, educational interventions at the Islamic University of Madinah are tailored to the specific requirements of non-Arabic speaking students. This promotes a

bilingual education that acknowledges and integrates their self-identity, while also encouraging an appreciation for the external Arabian culture. These AI techniques together promote a more efficient and culturally comprehensive language learning experience.

### **Summary of Results**

#### **The Current Status of Bilingualism**

The non-Arabic speaking students of the Islamic University of Madinah have a moderate level of skill in bilingualism, as indicated by an arithmetic mean of 3.5593 and a standard deviation of 1.0525. Their proficiency in their home languages is higher (mean: 3.8222) compared to Arabic (mean: 3.5111), suggesting a superior command of their original languages. The prevalence of Arabic usage in informal social situations is greater (mean: 3.8000) compared to academic settings (mean: 3.6000), indicating a higher level of adaptation in less formal environments. The level of cultural integration achieved through language is modest, with a mean score of 3.5222. This indicates that there is a need for more extensive cultural immersion. Although students encounter academic challenges as a result of language hurdles (mean: 3.5667), they exhibit strong motivation to enhance their Arabic language ability (mean: 3.7111), indicating a favourable attitude towards attaining bilingual fluency.

#### **Challenges in Maintaining Linguistic Balance**

Students encounter moderate difficulties in maintaining language equilibrium, with an average score of 3.4531 and a standard deviation of 1.0529. The main challenges faced include linguistic discrimination (mean: 3.6000), the utilisation of technical tools to enhance language proficiency (mean: 3.5556), and the importance of assistance from peers (mean: 3.5333). The

challenges in achieving language equilibrium have a significant effect on both academic achievement (mean: 3.4889) and mental well-being (mean: 3.4667). Furthermore, the challenges that stand out are the limited accessibility of resources (mean: 3.4667) and the impact of cultural variations on language acquisition (mean: 3.4444). Language interference, with a mean score of 3.4222, poses a substantial obstacle. The current educational approaches have been assessed as somewhat effective (mean: 3.1000), suggesting a requirement for enhanced teaching strategies. These concerns highlight the necessity of providing comprehensive assistance to tackle linguistic equilibrium problems among students who do not speak Arabic.

#### Leveraging AI for personalised interventions

AI-powered interventions can assist students who do not speak Arabic in attaining balanced bilingualism by providing tailored, culturally inclusive lessons and immediate feedback. Adaptive learning platforms such as Duolingo and Rosetta Stone improve the process of acquiring language skills and increase user involvement. Natural Language Processing (NLP) techniques enhance comprehension of language and culture by facilitating interactive learning. By utilising cultural sensitivity algorithms and tailored content delivery, we guarantee the provision of pertinent and captivating learning materials. Virtual reality (VR) and augmented reality (AR) technology offer immersive experiences that enhance practical language skills. Predictive analytics are used to identify kids who are at risk and provide them with customised support. Collaborative learning environments facilitate cultural interaction and mutual understanding, which are crucial for cultivating well-rounded bilingual and bicultural identities. These AI approaches promote a more efficient and culturally diverse language learning

experience, honouring pupils' self-identity while promoting acceptance of Arabian culture.

Limitations of the study:

The study had certain limitations. It focused on examining the difficulties encountered by non-Arabic speaking students at the Islamic University of Madinah in relation to bilingualism. The study employed a descriptive analytical approach and collected data from 35 participants through questionnaires. Nevertheless, additional comprehensive research is necessary to validate its discoveries, particularly with regard to the enduring efficacy of AI-powered educational systems in enhancing language skills and fostering cultural assimilation. In addition, it is imperative to have larger and more varied samples in order to extrapolate the findings to different populations. Furthermore, it is crucial to include objective metrics alongside self-reported data to augment the validity of the results.

### **Recommendations**

1. Educational institutions ought to include AI-driven language learning programs, such as Duolingo, Rosetta Stone, and Babbel, into their curricula to provide customised learning paths, immediate feedback, and adaptable courses that cater to the specific needs of each student.
2. Universities should build specialised centres that offer language tutoring, academic support, and counselling services, which should include individualised tutoring, language practice sessions, and academic guidance specifically tailored for students who do not speak Arabic as their first language.
3. Teacher training programs should enhance educators' effectiveness in instructing bilingual students by offering professional development focused on culturally responsive



teaching practices, the integration of technology in language instruction, and strategies for addressing linguistic challenges.

4. Universities and language departments should organise cultural exchange programs and events to facilitate interactions between non-Arabic speaking students and native Arabic speakers, thereby improving language skills and fostering a deeper understanding of Arabian culture.
5. Educational institutions It is important to create customised learning programs for every student, using artificial intelligence to adapt the language instruction's content and speed to match their particular proficiency levels and learning preferences.
6. Suggestions
7. Performing longitudinal research to monitor the development of pupils who do not speak Arabic as their first language in attaining bilingual fluency over a period of time.
8. Examining the efficacy of different AI-powered language learning programs, such as Duolingo, Rosetta Stone, and Babbel, in facilitating language acquisition and cultural integration among students who do not speak Arabic.
9. Investigating the efficacy of cultural immersion programs and exchange activities in enhancing language proficiency and fostering cross-cultural comprehension.
10. Examining the efficacy of professional development initiatives for educators in enhancing their instructional capacity for teaching children who are bilingual.
11. Investigating the impact of several technology tools, such as virtual reality (VR) and augmented reality (AR) applications, on enhancing language acquisition by creating immersive experiences.

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